Cell Therapy

Iron Deficiency Decreases Oxidative Stress and Improves the Viability of the Bone-marrow-derived Mesenchymal Stem Cells *in vitro*

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BACKGROUND

Like all other stem cells, the bone marrow-derived mesenchymal stem cells are the multipotential cells keeping their self-renewal properties during sequential cell divisions. These cells can be targeted for differentiating into various types of the cells such as neurons, chondrocytes and osteocytes used for the cell transplantation purposes. Recent studies show that about 99% of these transplanted cells are destroyed by oxidative stresses. The study described here was designed to increase the BM-MSCs' viability against the oxidative stresses using Deferoxamine (DFO) as an iron chelator which has been already shown that protects the cells by upregulating a cytoprotective protein called HIF-1α.

METHODS

BM-MSCs were isolated from the rat femur and cultured in DMEM-LG medium and 20% FBS. Using MTT assay, viability of the H_2O_2 and DFO-exposed BM-MSCs at different doses was evaluated, separately. Then, BM-MSCs pretreated with DFO (for 48h) were treated with calculated IC_{50} dose of H_2O_2, and the rate of cell viability was investigated again. To find out whether DFO enhances BM-MSCs protection against oxidative stress induced by H_2O_2, HIF-1α expression level was determined both in DFO-treated and untreated cells by qRT-PCR methods.

RESULTS

IC50 dose for H_2O_2 treatment of BM-MScs was 0.55 mM. We also showed that the maximum effective dose of DFO was about 5 µM. Pretreating with DFO in H_2O_2-exposed BM-MSCs significantly increased the cell viability in untreated group compare to treated group. It was also cleared that HIF-1α level was upregulated in DFO-treated cells compared to the unexposed group.

CONCLUSTION

Our findings obviously show that DFO through inducing iron deficiency mechanism overexpress HIF-1α, and protects BM-MSCs against oxidative stress induced by H_2O_2 and improves their viability.

KEY WORDS

Bone Marrow Mesenchymal Stem Cell, Oxidative Stress, Deferoxamine, Viability

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